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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/802,048	03/08/2001	Chia-Lin Hsu	JC-6856-C	2769

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EXAMINER

RAO, SHRINIVAS H

ART UNIT PAPER NUMBER

2814

DATE MAILED: 09/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/802,048

Applicant(s)

HSU ET AL.

Examiner

Steven H. Rao

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-- The MAILING-DATE of this communication appears on the cover sheet with the corresponding address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1,3-17 and 21-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1,3-17, 21-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Response to Amendment

Applicants' amendment filed on July 09, 2003 has been entered on July 14, 2003.

Therefore claims 1, 3-5 and 11 as amended by the amendment and claims 6-10,12-17, 21-22 as previously recited and presently newly added claim 23 are currently pending in the Application.

Claim 2 has been cancelled by the present amendment and claims 18-20 were previously cancelled.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-17 and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farkas et al. (U.S. Patent No. 6,001, 730, herein after Farkas) previously applied and Penniman (U.S. Patent No.5, 373,229 herein after Penniman) both previously applied. (for response to Applicants' arguments see section below) .

With respect to claims 1 and 11, Farkas discloses a method of fabricating a damascene structure including:

Providing a substrate (Farkas fig.1 #12,col.3 lines 53-54), forming a dielectric layer (Farkas col.3 lines 6 to col. 4 lines 2, not shown in figures), defining the dielectric

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layer to form an opening to expose a portion of the substrate (Farkas figure 1, etching 16 to form opening), forming a barrier layer conformal to the profile of the opening (fig. 1 3 18, col. 4 lines 25-26), forming a metal layer over the substrate wherein the metal layer fills the opening and covers the dielectric (fig. 1, #22, col.4 lines 59-60), performing a first CMP with a first slurry to remove the metal layer till the barrier layer is exposed (fig. 3 24, col.5 lines 24-60 until layer 21 is exposed) performing a second CMP process with a second slurry and an oxidant to remove the barrier layer wherein the oxidant oxidizes the metal layer to adjust the zeta potential of the metal layer during the removal of the barrier layer. (Col. 7 lines 47-50; col. 7 lines 65-66 and col. 8 lines 1-10, lines 22-25).

With regard to Zeta potential a good starting point is the definition of zeta potential or Elektro- kinetic potential:

Zeta potential is an electrokinetic property of particles suspended in an aqueous medium containing charged ionic species and is an expression of the charge developed on or adjacent to such particles. It has been recognised that the Zeta potential of fibrous particles in the feed stock or furnish, used in paper making, has a considerable influence upon the paper produced therefrom. Zeta potential cannot be measured directly; however, it can be calculated from measurements of a related parameter known as streaming potential.

A general discussion of Zeta potential and its relevance to paper making is provided in "Electrokinetics in Paper Making—a position paper" by R. A. Stratton and J. W. Swanson in TAPPI, 64 No. 1, page 79–83 (1981). A survey of various methods of measuring Zeta potential, including those reliant upon measurements of streaming potential, is given in an article by H. J. Jacobasch et al. in Colloid and Polymer Science 263; 3–24 (1985).

(Penniman col. 1 lines 13-23).

Therefore Zeta potential is an electrokinetic property of particles suspended in an aqueous medium containing charged ionic species and is an expression of the charge developed on or adjacent to such particles.

As shown above Farkas second CMP slurry is a deionized water based slurry containing containing charged ionic species (ethylenediamine and other solids partially disassociated in water to form charged ionic species). Further is known that charged ionic species (particles) in water have charges developed on or adjacent to such particles.

Therefore Farkas without specifically stating the words "zeta potential " clearly describes a method by which zeta potential is created.

Further the recited step of adjusting the zeta potential of the metal surface during the removal of the barrier layer is a functionally inherent step.

It is well settled law that, " it is elementary that the mere recitation of a newly discovered function or property, inherently possessed by things discovered function or property, inherently possessed by things in the prior art, does not cause a claim drawn to distinguish over the prior art. Additionally, where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on. In re Swinehart, 169 USPQ 226 (CCPA 1971).

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It is also noted that Farkas describes the second CMP step or the oxide polish step as the barrier removal etch to etch layers 20-22 (including barrier layer 21) removal figs. 5 and 6).

Therefore all the limitations presently recited in claim 1 is taught/suggested by Farkas.

With respect to claims 2 and 3 wherein the solution is an oxidant selected from KIO_3 , H_2O_2 , $Fe(NO_3)_3$ and NH_4SSO_8 (col. 1 lines 56, Col. 8 line 5 and col. 7 line 39).

With respect to claim 4 wherein the oxidant is 0.1 % to 5 % of the slurry. (Col. 7 line 36- 0.01-2.0 %, therefore 0.1 to 5.0 % obvious in view of the overlapping range).

With respect to claim 5, wherein the oxidant is either dissolved into the solution col. 7 lines 31-36) and then mixed up with the second slurry on the polishing pad from different pipelines (col. 7 line 41-44) or added directly to the second slurry (col. 7 line 31-36).

With respect to claim 6, wherein the low-K dielectric material organic polymers like fluorinated hydrocarbon, HSQ etc. (col. 4 line 17-fluorinated TEOS).

With respect to claim 7, wherein the metal layer is copper, tungsten and aluminum (col. 4 line 59).

With respect to claims 8 and 9 , wherein the pH of the second slurry is neutral (col. 7 line 52 and claims 28-29 basic-alkaline pH)

With respect to claim 10, wherein the opening can be a damascene opening, a trench for metal conductive line, a via opening for a plug, a contact opening or an opening for a damascene structure. (col. 1 line 16-17).

Claims 12 (repeats the steps of claim 5), 13 (repeats the steps of claim 3), 14 repeats the steps of claim 4), 14 (repeats the steps of claim 6), 15 (repeats the steps of claim 8), 16 (repeats the steps of claim 9), 17 (repeats the steps of claim 7) and all are rejected for reasons stated above under the respective claims.

With respect to claims 21 and 22, wherein the second slurry for removing the barrier layer comprises an oxidant, abrasive particles, surfactant, buffer solution and anti-corrosive. (Farkas col. 7 lines 10-55 and claims).

With respect to claim 23 , wherein the reaction between the metal layer and the oxidant comprises oxidizing the metal layer with the oxidant to form an oxide layer on a surface of the metal layer . (Farakas col. 7 lines 47-50; col. 7 lines 65-66 and col. 8 lines 1-10, lines 22-25).

Response to Arguments

Applicant's arguments filed 7/14/03 have been fully considered but they are not persuasive because Applicants' contend that Farakas does not teach or suggest that the adjustment of the zeta potential in Farakas is allegedly not resulted from an oxidation reaction between the metal layer and the oxidant is not persuasive because Farakas in col. 8 lines 22 to 25 states :

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layers herein. Other oxidation agents other than H_2O_2 may be used wherein the oxidation agent taught herein can be any chemical that oxidized copper. A triazole derivative, as discussed herein, is any triazole molecule that has any other atoms bonded to the triazole molecule. Therefore, it is intended that this invention encompass all of the variations and modifications as fall within the scope of the appended claims.

Therefore Farakas clearly shows oxidation of the metal (including copper) by the oxidant.

Therefore all the presently recited limitations are taught by the applied references.

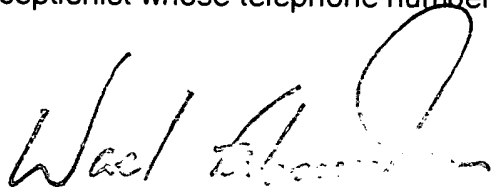
Applicants' contention that limitations of dependent claim 7 makes the prior art applied to claims independent claims 1 and 11 legally deficient is not understood .

Further how newly added claim dependent 23 limitations render independent claim 11 distinguish over the applied art is not understood.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven H. Rao whose telephone number is (703) 3065945. The examiner can normally be reached on 8.00 to 5.00.

The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-3926 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 3067722.



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